

**What is claimed is:**

1           1. An apparatus, comprising:

2           a management information system outputting alarm information corresponding to an  
3           alarm event and outputting an alarm clear signal corresponding to an end of said alarm event;

4           an alarm management host receiving said alarm information, said host having a  
5           broadcasting list data table, said host having an alarm database including a first data table and a  
6           second data table, said host having a plurality of memory spaces and a plurality of listener tables;

7           a processor being coupled to said host, said processor storing said alarm information in  
8           said first data table when said alarm information is received by said host, said processor  
9           removing said alarm information from said first data table and storing said alarm information in  
10           said second data table when said alarm event is cleared, said alarm event being cleared when said  
11           alarm clear signal is output; and

12           a plurality of alarm managers being connected to said host, said plurality of alarm  
13           managers including a first alarm manager, said listener tables including a first listener table  
14           corresponding to said first alarm manager, each of said listener tables having a unique name  
15           listed in said broadcasting list data table, said first listener table having a first unique name;

16           said processor storing said alarm information in each of said listener tables listed in said  
17           broadcasting list data table;

18           after said storing of said alarm information in said listener tables is completed, said alarm  
19           managers reading said alarm information stored in said respective listener tables;

20           when said reading of said alarm information is performed, said alarm managers  
21           performing at least one selected from among displaying said alarm information, printing said  
22           alarm information, transmitting an e-mail message including said alarm information, transmitting  
23           a pager message including said alarm information, and transmitting a facsimile message  
24           including said alarm information;

25           when said reading of said alarm information is performed, said alarm managers removing  
26           said alarm information from said listener tables to prevent re-reading of said alarm information;

27           when said management information system performs said outputting of said alarm clear  
28           signal, said processor performing said removing of said alarm information from said first data  
29           table and performing said storing of said alarm information in said second data table.

2.       The apparatus of claim 1, when said first alarm manager is being powered off,  
said first alarm manager requesting that said processor remove said first listener table, said  
processor removing said first listener table in response to said request of said first alarm  
manager.

1           3.       The apparatus of claim 1, said processor performing said removing of said alarm  
2           information from said first data table and performing said storing of said alarm information in  
3           said second data table, in response to an operator request.

1           4.       The apparatus of claim 1, said alarm managers monitoring changes of said alarm

2 information in said first and second data tables, and displaying results of said monitoring.

1           5. The apparatus of claim 1, said alarm managers performing said reading  
2 periodically.

1           6. The apparatus of claim 1, said alarm managers performing said reading in  
2 response to an operator request.

7. The apparatus of claim 1, said alarm managers performing said reading in  
response to said alarm information being stored in said listener tables.

8. The apparatus of claim 1, said alarm managers performing said reading in  
response to said alarm event.

9. The apparatus of claim 1, said listed listener tables being set to a lock mode before  
2 said processor performs said storing of said alarm information in said listed listener tables, said  
3 lock mode preventing said alarm managers from accessing said listed listener tables during said  
4 storing of said alarm information in said listed listener tables.

1           10. The apparatus of claim 9, said processor performing said setting of said listed  
2 listener tables in said lock mode.

1        11. The apparatus of claim 9, said lock mode being released after said storing of said  
2 alarm information in said listed listener tables is completed.

1        12. The apparatus of claim 9, said alarm managers performing said reading  
2 periodically by polling.

1        13. The apparatus of claim 1, said first listener table being set to a lock mode before  
2 said first alarm manager performs said reading of said alarm information stored in said first  
3 listener table, said lock mode preventing said processor from accessing said first listener table  
4 during said reading of said alarm information in said first listener table.

1        14. The apparatus of claim 13, said first alarm manager performing said setting of  
2 said first listener table in said lock mode.

1        15. The apparatus of claim 13, said lock mode being released after said reading of  
2 said alarm information in said first listener table is completed.

1        16. The apparatus of claim 1, said processor performing said storing of said alarm  
2 information in each of said listed listener tables substantially simultaneously.

1       17. The apparatus of claim 1, said alarm information including at least one selected  
2       from among an alarm event position, an alarm event type, an alarm event level, an alarm event  
3       cause, additional alarm event information, and an alarm event time.

1       18. The apparatus of claim 1, said processor assigning an unused alarm identifier to  
2       said alarm information when storing said alarm information in said first data table.

1       19. The apparatus of claim 1, said processor sensing whether said plurality of alarm  
2       managers are operating correctly, after said alarm event is detected and before said processor  
3       stores said alarm information in each of said listener tables listed in said broadcasting list data  
4       table.

1       20. The apparatus of claim 4, said first unique name being removed from said  
2       broadcasting list data table when said first alarm manager is not operating correctly, after said  
3       processor performs said sensing and before said processor stores said alarm information in each  
4       of said listener tables listed in said broadcasting list data table.

1       21. The apparatus of claim 1, said processor creating said first and second data tables  
2       in said alarm database.

1       22. The apparatus of claim 1, said first data table being smaller than said second data

2 table.

1        23. The apparatus of claim 1, said first data table being for storing said alarm  
2 information when said alarm event is not cleared, said second data table being for storing said  
3 alarm information when said alarm event is cleared.

1        24. The apparatus of claim 1, said plurality of alarm managers securing said memory  
2 spaces in said host and creating said listener tables in said secured memory spaces.

25. The apparatus of claim 1, each respective one of said alarm managers securing  
one respective memory space from among said memory spaces, each respective one of said alarm  
managers creating one respective listener table in said secured respective memory space.

26. An apparatus for managing an alarm event occurring in a network, said system  
comprising:

3        a management information system outputting alarm information corresponding to an  
4 alarm event;

5        an alarm management host computer managing said alarm information received from said  
6 management information system; and

7        a plurality of alarm managers being connected to said alarm management host computer,  
8 said plurality of alarm managers reading said alarm information when said alarm information is

not cleared, said plurality of alarm managers including a first alarm manager; said alarm management host computer having a first data table for storing said alarm information when said alarm information is not cleared, a second data table for storing said alarm information when said alarm information is cleared, said alarm management host computer storing said alarm information in said first data table when said alarm information is not cleared, said alarm management host computer removing said alarm information from said first data table and storing said alarm information in said second data table when said alarm information is cleared, said alarm information being cleared when said alarm event ends.

27. The apparatus of claim 26, said alarm information being not cleared when said alarm event has not ended, said alarm information being cleared when said alarm event ends.

28. The apparatus of claim 27, said management information system outputting an alarm clear signal corresponding to said end of said alarm event.

29. The apparatus of claim 28, said alarm management host computer clearing said alarm information in response to said alarm clear signal, said alarm management host computer removing said alarm information from said first data table and storing said alarm information in said second data table in response to said alarm clear signal.

30. The apparatus of claim 29, said alarm management host computer including a

2 broadcasting list data table and a plurality of listener data tables including a first listener data  
3 table, each one of said listener data tables having a unique name, said broadcasting list data table  
4 storing each unique name of each one of said listener data tables, each respective one of said  
5 listener data tables corresponding to a respective one of said alarm managers.

1           31. The apparatus of claim 30, said name of said first listener data table being  
2 removed from said broadcasting list data table when said first alarm manager is detected as not  
3 operating normally, said first alarm manager corresponding to said first listener data table.

1           32. The apparatus of claim 31, said alarm information being stored in each one of said  
2 plurality of listener data tables listed on said broadcasting list data table when said alarm  
3 information is stored in said first data table, said alarm information stored in each one of said  
4 listed listener data tables being read by said corresponding alarm managers.

1           33. The apparatus of claim 32, said alarm managers reading said alarm information  
2 from said corresponding listener data tables by polling.

1           34. The apparatus of claim 26, said alarm management host computer transmitting  
2 said alarm information to said alarm managers in response to a request from said alarm  
3 managers.

1        35. An alarm management method for an alarm management processor connected to a  
2        plurality of alarm managers, comprising the steps of:

3                making an uncleared alarm table for storing alarm information corresponding to an alarm  
4        event that is generated from a network and that is not cleared, and making a cleared alarm table  
5        for storing alarm information corresponding to an alarm event that is cleared;

6                making a plurality of listener tables corresponding to the alarm managers;

7                registering the listener tables in a broadcasting list table;

8                storing alarm information in the uncleared alarm table when the alarm event is generated  
from the network;

9                storing the alarm information in the listener tables registered in the broadcasting list table;

10                reading the alarm information from the listener tables, said reading being performed by  
11        the alarm managers; and

12                when the alarm event is released, clearing the alarm information from the uncleared alarm  
table and storing the alarm information in the cleared alarm table.

1        36. The method of claim 35, further comprising the steps of:

2                displaying the alarm information and then clearing the alarm information from the  
3        listener tables, said displaying and clearing being performed by the alarm managers.

1        37. The method of claim 36, said reading of the alarm information from the listener  
2        tables being performed by the alarm managers using polling.

1           38. The method of claim 37, said storing of alarm information in the listener tables  
2 further comprising the steps of:  
3           setting the listener tables to a lock mode;  
4           storing the alarm information in the listener tables; and  
5           releasing the listener tables from the lock mode.

1           39. The method of claim 35, further comprising the steps of:  
2           checking whether the alarm managers corresponding to the listener tables registered in the  
3 broadcasting list table are normally operating when the alarm event is generated from the  
4 network; and  
5           removing from the broadcasting list table the listener tables corresponding to any alarm  
6 managers that are not normally operating.

1           40. The method of claim 35, said reading of the alarm information from the listener  
2 tables further comprising the steps of:  
3           setting the listener tables to a lock mode, said setting being performed by the alarm  
4 managers;  
5           reading the alarm information from the listener tables, said reading being performed by  
6 the alarm managers; and  
7           releasing the listener tables from the lock mode, said releasing being performed by the

8 alarm managers.

1 41. A method, comprising:

2 outputting alarm information corresponding to an alarm event and outputting an alarm  
3 clear signal corresponding to an end of said alarm event, said outputting being performed by a  
4 network;

5 receiving said alarm information, said receiving being performed by a host, said host  
6 having a broadcasting list data table, a plurality of memory spaces, a plurality of listener tables,  
7 and an alarm database including a first data table and a second data table;

8 when said alarm information is received by said host, storing said alarm information in  
9 said first data table;

10 when said alarm event is cleared, removing said alarm information from said first data  
11 table and storing said alarm information in said second data table, said alarm event being cleared  
12 in response to said outputting of said alarm clear signal;

13 connecting a plurality of alarm managers to said host, said plurality of alarm managers  
14 including a first alarm manager, said listener tables including a first listener table corresponding  
15 to said first alarm manager, each of said listener tables having a unique name listed in said  
16 broadcasting list data table, said first listener table having a first unique name;

17 storing said alarm information in each of said listener tables listed in said broadcasting  
18 list data table;

19 after said storing of said alarm information in said listener tables is completed, reading

20 said alarm information stored in said listener tables, said reading of said alarm information stored  
21 in said listener tables corresponding to each one of said respective alarm managers reading said  
22 alarm information stored in each one of said respective listener tables;

23 when said reading of said alarm information is performed by said alarm managers,  
24 performing at least one selected from among displaying said alarm information, printing said  
25 alarm information, transmitting an e-mail message including said alarm information, transmitting  
26 a pager message including said alarm information, and transmitting a facsimile message  
27 including said alarm information;

28 when said reading of said alarm information is performed, removing said alarm  
29 information from said listener tables to prevent re-reading of said alarm information; and

30 when said management information system performs said outputting of said alarm clear  
31 signal, performing said removing of said alarm information from said first data table and  
32 performing said storing of said alarm information in said second data table.

42. The method of claim 41, further comprising:

2 when said first alarm manager is being powered off, requesting that said first listener  
3 table be removed from said broadcasting list data table, and removing said first listener table in  
4 response to said requesting.

1 43. The method of claim 41, said removing of said alarm information from said first  
2 data table and said storing of said alarm information in said second data table being performed in

3 response to an operator request.

1           44. The method of claim 41, further comprising monitoring changes of said alarm  
2 information in said first and second data tables, and displaying results of said monitoring.

1           45. The method of claim 41, said reading of said alarm information being performed  
2 by said alarm managers periodically.

46. The method of claim 41, said reading of said alarm information being performed  
by said alarm managers in response to an operator request.

47. The method of claim 41, said reading of said alarm information being performed  
by said alarm managers in response to said alarm event.

48. The method of claim 41, said listed listener tables being set to a first lock mode  
2 before said storing of said alarm information in said listed listener tables, said first lock mode  
3 preventing said alarm managers from accessing said listed listener tables during said storing of  
4 said alarm information in said listed listener tables.

1           49: The method of claim 48, said first lock mode being released after said storing of  
2 said alarm information in said listed listener tables is completed.

1        50. The method of claim 49, said first listener table being set to a second lock mode  
2 before said first alarm manager performs said reading of said alarm information stored in said  
3 first listener table, said second lock mode allowing only said first alarm manager to access said  
4 first listener table during said reading of said alarm information in said first listener table.

1        51. The method of claim 50, said setting of said first listener table in said second lock  
2 mode being performed by said first alarm manager.

1        52. The method of claim 51, further comprising releasing said second lock mode after  
2 said reading by said first alarm manager of said alarm information in said first listener table is  
3 completed.

1        53. The method of claim 52, said storing of said alarm information in each of said  
2 listed listener tables being performed substantially simultaneously.

1        54. The method of claim 53, said alarm information including at least one selected  
2 from among an alarm event position, an alarm event type, an alarm event level, an alarm event  
3 cause, additional alarm event information, and an alarm event time.

1        55. The method of claim 54, further comprising assigning an unused alarm identifier

2 to said alarm information when storing said alarm information in said first data table.

1 56. The method of claim 55, further comprising sensing whether said plurality of  
2 alarm managers are operating correctly, after said alarm event is detected and before said storing  
3 of said alarm information in each of said listener tables listed in said broadcasting list data table.

1 57. The method of claim 56, further comprising removing said first unique name from  
2 said broadcasting list data table when said first alarm manager is not operating correctly, after  
3 said performing of said sensing and before storing of said alarm information in each of said  
listener tables listed in said broadcasting list data table.

58. The method of claim 57, said first data table being for storing said alarm  
information when said alarm event is not cleared, said second data table being for storing said  
alarm information when said alarm event is cleared.

1 59. The method of claim 41, said alarm information including at least one selected  
2 from among an alarm event position, an alarm event type, an alarm event level, an alarm event  
3 cause, additional alarm event information, and an alarm event time.

1 60. The method of claim 41, further comprising assigning an unused alarm identifier  
2 to said alarm information when storing said alarm information in said first data table.

1        61. The method of claim 41, further comprising sensing whether said plurality of  
2        alarm managers are operating correctly, after said alarm event is detected and before said storing  
3        of said alarm information in each of said listener tables listed in said broadcasting list data table.

1        62. The method of claim 41, further comprising removing said first unique name from  
2        said broadcasting list data table when said first alarm manager is not operating correctly, after  
3        said performing of said sensing and before storing of said alarm information in each of said  
4        listener tables listed in said broadcasting list data table.

1        63. The method of claim 41, said first data table being for storing said alarm  
2        information when said alarm event is not cleared, said second data table being for storing said  
3        alarm information when said alarm event is cleared.

1        64. An alarm management method for a network management system, comprising the  
2        steps of:

3                making an uncleared alarm table for storing alarm information that is generated from a  
4                network and that is not cleared, and making a cleared alarm table for storing alarm information  
5                that is cleared;

6                storing first alarm information in the uncleared alarm table when the first alarm  
7                information is generated from the network, said first alarm information corresponding to an

8       alarm event; and  
9               when the alarm event ends, removing said first alarm information from the uncleared  
10      alarm table and storing the first alarm information in the cleared alarm table.

1       65.      The method of claim 64, further comprising:  
2               writing said first alarm information from said uncleared alarm table to a plurality of  
3      listener tables;  
4               reading said first alarm information from said listener tables with a plurality of alarm  
managers; and  
displaying said first alarm information read from said listener tables with said plurality of  
alarm managers.

2       66.      An alarm management method for managing an alarm in a network, said method  
3      comprising:  
4               creating a plurality of listener data tables for storing information, each one of said listener  
data tables corresponding to one respective alarm manager selected from among a plurality of  
5      alarm managers, each one of said listener data tables having a unique name;  
6               detecting whether said alarm managers are operating normally;  
7               registering in a broadcasting list data table said unique names identifying said listener  
data tables corresponding to said alarm managers that are detected to be operating normally;  
8               when an alarm event is generated in said network, storing first alarm information in said

10        listener data tables corresponding to said names registered in said broadcasting list data table;  
11        and  
12            reading said first alarm information from said listener data tables by said corresponding  
13        alarm managers.

1        67.        The method of claim 66, further comprising:  
2            periodically detecting whether said alarm managers are operating normally; and  
3            removing from said broadcasting list data table said names of listener data tables  
4        corresponding to said alarm managers that are detected to be not operating normally.